



# SLOVENSKI STANDARD

## SIST EN 13763-16:2004

01-februar-2004

---

### Eksplozivi za civilno uporabo – Detonatorji in zakasnilniki – 16. del: Ugotavljanje časa zakasnitve

Explosives for civil uses - Detonators and relays - Part 16: Determination of delay accuracy

Explosivstoffe für zivile Zwecke - Zünder und Verzögerungselemente - Teil 16: Bestimmung der Verzögerungsgenauigkeit

Explosifs a usage civil - Détonateurs et relais - Partie 16: Détermination de la précision du retard

[SIST EN 13763-16:2004](https://standards.iteh.ai/catalog/standards/sist/1394d4bc-0752-4ee7-bf8c-1d1d961a0506/sist-en-13763-16-2004)

[https://standards.iteh.ai/catalog/standards/sist/1394d4bc-0752-4ee7-bf8c-](https://standards.iteh.ai/catalog/standards/sist/1394d4bc-0752-4ee7-bf8c-1d1d961a0506/sist-en-13763-16-2004)

[1d1d961a0506/sist-en-13763-16-2004](https://standards.iteh.ai/catalog/standards/sist/1394d4bc-0752-4ee7-bf8c-1d1d961a0506/sist-en-13763-16-2004)

Ta slovenski standard je istoveten z: **EN 13763-16:2003**

---

#### **ICS:**

71.100.30      Eksplozivi. Pirotehnika      Explosives. Pyrotechnics

**SIST EN 13763-16:2004**

**en**

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST EN 13763-16:2004

<https://standards.iteh.ai/catalog/standards/sist/1394d4bc-0752-4ee7-bf8c-1d1d961a0506/sist-en-13763-16-2004>

ICS 71.100.30

English version

## Explosives for civil uses - Detonators and relays - Part 16: Determination of delay accuracy

Explosifs à usage civil - Détonateurs et relais - Partie 16:  
Détermination de la précision du retard

Explosivstoffe für zivile Zwecke - Zünder und  
Verzögerungselemente - Teil 16: Bestimmung der  
Verzögerungsgenauigkeit

This European Standard was approved by CEN on 10 November 2003.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and United Kingdom.

[SIST EN 13763-16:2004](https://standards.iteh.ai/catalog/standards/sist/1394d4bc-0752-4ee7-bf8c-1d1d961a0506/sist-en-13763-16-2004)

<https://standards.iteh.ai/catalog/standards/sist/1394d4bc-0752-4ee7-bf8c-1d1d961a0506/sist-en-13763-16-2004>



EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

<b>Contents</b>		<b>page</b>
Foreword.....		3
Introduction .....		5
1 Scope .....		6
2 Normative references .....		6
3 Terms and definitions.....		6
4 Test pieces.....		6
5 Apparatus .....		6
6 Procedure .....		7
7 Expression of results .....		7
8 Test report .....		7
Annex A (informative) Range of applicability of the test method.....		9
Annex B (normative) Calculation of results .....		10
Annex C (informative) Guidance for theoretical verification .....		14
Annex ZA (informative) Clauses of this European Standard addressing essential requirements or other provisions of EU Directives .....		19

[SIST EN 13763-16:2004](https://standards.iteh.ai/catalog/standards/sist/1394d4bc-0752-4ee7-bf8c-1d1d961a0506/sist-en-13763-16-2004)  
<https://standards.iteh.ai/catalog/standards/sist/1394d4bc-0752-4ee7-bf8c-1d1d961a0506/sist-en-13763-16-2004>

## Foreword

This document (EN 13763-16:2003) has been prepared by Technical Committee CEN/TC 321 "Explosives for civil uses", the secretariat of which is held by AENOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2004, and conflicting national standards shall be withdrawn at the latest by June 2004.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative annex ZA, which is an integral part of this document.

Annexes A and C are informative. Annex B is normative.

This European Standard is one of a series of standards with the generic title *Explosives for civil uses – Detonators and relays*. The other parts of this series are listed below:

prEN 13763-1	Part 1: Requirements
EN 13763-2	Part 2: Determination of thermal stability
EN 13763-3	Part 3: Determination of sensitiveness to impact
EN 13763-4	Part 4: Determination of resistance to abrasion of leading wires and shock tubes
EN 13763-5	Part 5: Determination of resistance to cutting damage of leading wires and shock tubes
EN 13763-6	Part 6: Determination of resistance to cracking in low temperatures of leading wires
EN 13763-7	Part 7: Determination of the mechanical strength of leading wires, shock tubes, connections, crimps and closures
EN 13763-8	Part 8: Determination of the resistance to vibration of plain detonators
EN 13763-9	Part 9: Determination of resistance to bending of detonators
EN 13763-11	Part 11: Determination of resistance to damage by dropping of detonators and relays
EN 13763-12	Part 12: Determination of resistance to hydrostatic pressure
prEN 13763-13	Part 13: Determination of resistance of electric detonators against electrostatic discharge
prEN 13763-15	Part 15: Determination of equivalent initiating capability
EN 13763-17	Part 17: Determination of no-fire current of electric detonators
EN 13763-18	Part 18: Determination of series firing current of electric detonators
EN 13763-19	Part 19: Determination of firing impulse of electric detonators
EN 13763-20	Part 20: Determination of total electrical resistance of electric detonators
EN 13763-21	Part 21: Determination of flash-over voltage of electric detonators

## EN 13763-16:2003 (E)

- EN 13763-22 Part 22: Determination of capacitance, insulation resistance and insulation breakdown of leading wires
- EN 13763-23 Part 23: Determination of the shock-wave velocity of shock tube
- EN 13763-24 Part 24: Determination of the electrical non-conductivity of shock tube
- prEN 13763-25 Part 25: Determination of transfer capability of surface connectors, relays and coupling accessories
- prEN 13763-26 Part 26: Definitions, methods and requirements for devices and accessories for reliable and safe function of detonators and relays
- CEN/TS 13763-27 Part 27: Definitions, methods and requirements for electronic initiation systems

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

## iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN 13763-16:2004](https://standards.iteh.ai/catalog/standards/sist/1394d4bc-0752-4ee7-bf8c-1d1d961a0506/sist-en-13763-16-2004)

<https://standards.iteh.ai/catalog/standards/sist/1394d4bc-0752-4ee7-bf8c-1d1d961a0506/sist-en-13763-16-2004>

## Introduction

During blasting work, detonators and surface connectors with different delay times are used to ensure that the sequence of initiation of the explosive charges is executed in a controlled way. This test checks that the time interval between adjacent numbers in a manufacturer's series of delay type detonators and surface connectors lies within specified limits designed to reduce the risk of overlapping.

## iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN 13763-16:2004](https://standards.iteh.ai/catalog/standards/sist/1394d4bc-0752-4ee7-bf8c-1d1d961a0506/sist-en-13763-16-2004)

<https://standards.iteh.ai/catalog/standards/sist/1394d4bc-0752-4ee7-bf8c-1d1d961a0506/sist-en-13763-16-2004>

## 1 Scope

This European Standard specifies a method for determining the delay time accuracy of detonators and surface connectors with pyrotechnic delay elements. It does not apply to those with an electronic time delay.

## 2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 13857-1, *Explosives for civil uses — Part 1: Terminology*.

EN ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025:1999)*.

## 3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 13857-1 and the following apply.

### 3.1 overlapping

detonation out of intended sequence

### 3.2 outlier

value in a series of measured values significantly outside the normal distribution of the series and causing significant overlapping probability to adjacent interval numbers

## 4 Test pieces

Select 30 detonators or surface connectors of each interval number (i.e. nominal delay time stated by the manufacturer) from a specific type, having the same chemical composition, charge, dimensions and material of construction. For non-electric types, the length of shock tube attached to the detonator/surface connector during the test shall be specified by the manufacturer.

The detonators to be tested shall have an age of between two weeks and four months after the date of production.

## 5 Apparatus

**5.1 for electric detonators**, a power source able to produce a continuous current ( $i$ ) in accordance with the manufacturer's specification and within  $i_S \leq i \leq 2i_S$  ( $i_S$  is the series firing current for the type of detonator in question) with an accuracy of  $\pm 1,0$  %.

**5.2 for non-electric detonators/surface connectors**, an initiating device for initiating shock tubes (percussion cap, spark or initiating detonator providing that the shock tube and measuring equipment are protected against fragments from the detonator).

**5.3 timer or oscilloscope** to measure the delay time between the start pulse and the stop pulse with an accuracy of 0,1 ms.

**5.4** means for providing a start pulse to the timer/oscilloscope consisting for example of:



a) for electric detonators, an electric triggering circuit capable of providing an electric pulse at the time when the ignition current is applied; or

b) for non-electric detonators/surface connectors, an optical sensor or pressure sensor capable of providing an electric pulse when the shock-wave of the shock tube passes the sensor.

**5.5** means for providing a stop pulse to the timer/oscilloscope consisting for example of an optical sensor or pressure sensor capable of providing an electric pulse when the base charge (secondary charge) of the detonator/surface connector is initiated.

**5.6 conditioning chamber**, capable of maintaining a temperature in the range 15 °C to 30 °C within  $\pm 2$  °C.

## 6 Procedure

### 6.1 Conditioning

Condition the detonators or surface connectors in the conditioning chamber (see 5.6) for at least 2 h prior to testing, within  $\pm 2$  °C of a temperature specified by the manufacturer in the range 15 °C to 30 °C. In the case of magnetically coupled detonators, the transformer coupling unit shall be removed before testing.

### 6.2 Determination

The test shall be carried out within  $\pm 2$  °C of the conditioning temperature.

Connect the detonators or surface connectors to the apparatus (see 5.4). For non-electric detonators or surface connectors, install the optical start pulse sensor at the shock tube at a distance specified by the manufacturer, but at least 1 000 mm from the initiation point at the end of the shock tube (if necessary after removing the end sealing). Insert the detonators or surface connectors in the apparatus (see 5.5) so as to obtain a stop pulse from the optical sensor or pressure sensor when the base charge (secondary charge) of the detonator or surface connector is initiated.

Initiate the detonators or surface connectors and record the individual delay times and the number of misfires.

## 7 Expression of results

Calculate the results of the tests according to B.1 to B.5.

NOTE B.6 can optionally be used to present the results in B.1 and B.4 graphically.

## 8 Test report

The test report shall conform to EN ISO/IEC 17025. In addition, the following information shall be given:

- a) mean value of the delay times  $\bar{t}_k$  (in ms) and the standard deviation  $s_k$  for each interval number (according to B.1);
- b) number of misfires;
- c) number of "outlier" values for each interval number (according to B.3);
- d) except for surface connectors, the *c*-factor ( $c_k$ ) of each interval number (according to B.4);
- e) for surface connectors and non-electric detonators intended to be combined with surface connectors, the mean deviation from nominal delay time ( $r_k$ ) of each interval number (according to B.5);

f) for surface connectors and non-electric detonators intended to be combined with surface connectors, the maximum deviation from the nominal delay time  $r_{k, max}$  for each interval number  $k$ , specified by the manufacturer (indicated in the manufacturer's user manual);

g) nominal delay time  $t_{nom,k}$  for each interval number  $k$ , specified by the manufacturer (indicated in the manufacturer's user manual);

h) applied conditioning temperature during the tests.

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[SIST EN 13763-16:2004](#)

<https://standards.iteh.ai/catalog/standards/sist/1394d4bc-0752-4ee7-bf8c-1d1d961a0506/sist-en-13763-16-2004>

## Annex A (informative)

### Range of applicability of the test method

Range of applicability of the test method: - 30 °C to + 80 °C (see NOTE)

NOTE Due to the nature of pyrotechnics, the results of the delay time testing will vary with temperature. From the experience from former national standards, testing is only carried out at one defined temperature, usually + 20 °C. However if different pyrotechnic charges are used in adjacent interval numbers, proper measures should be taken in order to ensure that the possible differences in temperature dependency of these charges will not cause a significant probability of overlapping at high or low temperatures.

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[SIST EN 13763-16:2004](#)

<https://standards.iteh.ai/catalog/standards/sist/1394d4bc-0752-4ee7-bf8c-1d1d961a0506/sist-en-13763-16-2004>